

PATENT

Atty. Dkt. No. AMAT/2592.C7/DSM/LOW K/JW

REMARKS

This is intended as a full and complete response to the Final Office Action dated June 17, 2005, having a shortened statutory period for response set to expire on September 17, 2005. Please reconsider the claims pending in the application for reasons discussed below.

Claims 1-3, 5-13, 15-18, and 21 remain pending in the application. Claims 1-3, 5-13, 15-18, and 21 are rejected. Reconsideration of the rejection of claims 8, 11-13, 15-18, and 21 is requested for reasons presented below.

Applicants propose canceling claims 1-3, 5-7, and 9-10 and rewriting claim 8 in independent form. Applicants submit that the changes proposed here reduce the issues for appeal and do not introduce new matter or raise new issues.

Claims 1, 2, 6, 7 and 9-13 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over *Sugahara, et al.* (U.S. Patent No. 5,989,998). Applicants submit that the rejection of claims 1, 2, 6, 7, and 9-10 is moot, as Applicants propose canceling claims 1, 2, 6, 7, and 9-10. Applicants respectfully traverse the rejection of claims 11-13.

Regarding claim 11, Applicants respectfully submit that *Sugahara, et al.* shows and describes a stack of layers including two insulating layers 202, 204 and two silicon nitride layers 201, 203 (Figure 3A, column 8, lines 58-63), but does not teach or suggest depositing a plurality of layers comprising one low dielectric constant oxidized organosilane layer comprising carbon and a parylene, FSG, or silicon oxide layer. While *Sugahara, et al.* provides eleven embodiments for depositing insulating layers, including insulating layers that have an organosilicon compound as a main component, insulating layers that are fluorinated amorphous carbon layers, and insulating layers that are silicon oxide films containing a fluorinated carbon, *Sugahara, et al.* does not teach or suggest specific combinations of the different insulating layers to be used as the insulating films 202, 204 in the stack of layers shown in Figures 3A-3D. In particular, *Sugahara, et al.* does not teach or suggest depositing a plurality of layers comprising one low dielectric constant oxidized organosilane layer comprising carbon and a parylene, FSG, or silicon oxide layer.

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Therefore, *Sugahara, et al.* does not teach, show, or suggest a method comprising depositing on a substrate a plurality of layers, wherein the plurality of layers comprises one low dielectric constant oxidized organosilane layer comprising carbon, wherein the low dielectric constant oxidized organosilane layer is deposited in a plasma enhanced process from a mixture comprising an organosilane compound and an oxidizing gas and the carbon content of the low dielectric constant oxidized organosilane layer is from 1% to 50% by atomic weight, a layer selected from the group consisting of parylene, FSG, and silicon oxide layers, and a top layer of the plurality of layers that is a photoresist, as recited in claim 11. Applicants respectfully request withdrawal of the rejection of claim 11 and of claims 12-13, which depend thereon.

Claims 3 and 5 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Sugahara, et al.* in view of *Matsuura* (U.S. Patent No. 6,124,641). Applicants submit that the rejection of claims 3 and 5 is moot as Applicants propose canceling claims 3 and 5.

Claim 8 is rejected under 35 U.S.C. § 103(a) as being unpatentable over *Sugahara, et al.* in view of *Jeng, et al.* (U.S. Patent No. 5,780,338). The Examiner states that *Jeng, et al.* teaches a method of etching a low dielectric constant oxidized organosilane layer using fluorine, carbon, and oxygen ions and that it would have been obvious to combine the teachings of *Sugahara, et al.* and *Jeng, et al.* to enable the etching of the dielectric layer of *Sugahara, et al.* according to the teachings of *Jeng, et al.* Applicants respectfully traverse the rejection.

Sugahara, et al. is described above. *Jeng, et al.* describes etching layers including a silicon oxide layer using carbon, fluorine, and oxygen. However, *Sugahara, et al.* and *Jeng, et al.* alone or in combination do not describe or suggest etching a silicon oxide layer comprising carbon or a low dielectric constant oxidized organosilane layer comprising carbon with carbon, fluorine, and oxygen ions.

Therefore, *Sugahara, et al.* in view of *Jeng, et al.* does not teach, show, or suggest a method comprising depositing on a substrate a plurality of layers, wherein one or more of the layers is a low dielectric constant oxidized organosilane layer comprising carbon, wherein the low dielectric constant oxidized organosilane layer is deposited in a plasma enhanced process from a mixture comprising an organosilane

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compound and an oxidizing gas, the carbon content of the low dielectric constant oxidized organosilane layer is from 1% to 50% by atomic weight, and a top layer of the plurality of layers is a photoresist, and etching the low dielectric constant oxidized organosilane layer using fluorine, carbon, and oxygen ions, as recited in claim 8. Applicants respectfully request withdrawal of the rejection of claim 8.

Claims 15-18 and 21 are rejected under 35 U.S.C. § 103(a) as being unpatentable over *Sugahara, et al.* in view of *Matsuura*. The Examiner acknowledges that *Sugahara, et al.* fails to disclose using a methylsilane compound to deposit an oxidized organosilane layer. The Examiner asserts that one of ordinary skill in the art would have been motivated to use the methylsilane compound of *Matsuura* as an alternative suitable method of forming the organic oxide layer of *Sugahara, et al.* Applicants respectfully traverse the rejection.

Sugahara, et al. teaches that the presence of SiCH_3 in conventional organic SOG films is disadvantageous, since it reacts with oxygen during subsequent processing, resulting in the formation of water that contaminates the device containing the layer (column 2, lines 60-67). *Sugahara, et al.* indicates that by using an organic silicon compound having the formula $\text{R}^1_x\text{Si}(\text{OR}^2)_{4-x}$ or $\text{R}^1_x\text{SiH}_{4-x}$, wherein R^1 is a phenyl group or a vinyl group, R^2 is an alkyl group, and x is an integer of 1 to 3, the proportion of SiCH_3 in the layer is much lower than the amount contained in a conventional organic SOG film (column 3, lines 44-65). Thus, Applicants submit that *Sugahara, et al.* teaches away from depositing a film using a methylsilane compound, which contains a Si-CH_3 bond.

Matsuura describes using methylsilanes or vinylsilanes to deposit insulating films. However, *Matsuura* does not teach or suggest that methylsilanes and vinylsilanes can be used interchangeably to deposit identical films. *Matsuura* teaches that films comprising Si-CH_3 , Si-O , and Si-H bonds are formed when using methylsilane or methylsilane and dimethylsilane as the precursor (column 4, lines 45-48, column 5, lines 22-26, column 6, lines 5-8, lines 26-27), and that films comprising Si-CH=CH_2 , Si-O , and Si-H bonds are formed when using vinylsilane as the precursor (column 7, lines 15-36).

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Applicants submit that there is a reasonable expectation from the combination of *Sugahara, et al.* and *Matsuura* that replacing *Sugahara, et al.*'s vinylsilane and phenylsilane precursors with *Matsuura*'s methylsilane precursors would substantially alter *Sugahara, et al.*'s layer to include unwanted Si-CH₃ bonds. Thus, Applicants submit that the Examiner's combination of *Sugahara, et al.* and *Matsuura* is improper as using *Matsuura*'s methylsilane precursors would render *Sugahara, et al.*'s layer unsatisfactory for its intended purpose, *i.e.*, providing a layer having a low Si-CH₃ bond content (MPEP 2143.01). Withdrawal of the rejection of claim 15 and of claims 18 and 21 is respectfully requested.

The secondary references made of record are noted. However, it is believed that the secondary references are no more pertinent to the Applicants' disclosure than the primary references cited in the Final Office Action. Therefore, Applicants believe that a detailed discussion of the secondary references is not necessary for a full and complete response to this Final Office Action.

Having addressed all issues set out in the Final Office Action, Applicants respectfully submit that the claims are in condition for allowance and respectfully request that the claims be allowed.

Respectfully submitted,



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